

FINGER VEIN EXTRACTION AND AUTHENTICATION FOR SECURITY PURPOSE

Johnthangavel.P¹ Abarna.M², Aruna.P³, Anitha.S⁴

^{1,2,3,4}, Dept. of ECE, Jeppiaar SRR Engineering College, Tamil Nadu, India.

Abstract - The main aim of the project is to use finger vein for secured transaction instead of ATM Card. Finger vein recognition technology is one of the new bio metric technology, which is hidden inside the human body, difficult to steal and imitate etc. Finger vein ID matches the vascular pattern which is an individual's finger to the previously obtained data. If the finger vein matches with an authenticated person's it becomes a successful transaction. If the finger vein belongs to an unauthenticated person the ATM door closes automatically with a buzzer sound outside the ATM alerting the people outside that person tries to rob or steal the money from ATM.

Key Words: Arduino controller, GSM, Sensor.

1. INTRODUCTION

Biometric authentication system is used as a security process system to rely the unique biological characteristics of an individual for identification. This system compares the captured data to the stored data in a database. Also biometric authentication is recently used technology almost in all fields for facial recognition, eye scanners, speaker's recognition etc. This technology is being gradually implemented to identify theft, such as terrorism or cyber-crime etc. Biometric technology is of category

- I. Physiological measurements
- II. Behavioral measurements
- III. Finger vein recognition
- IV. Finger vein pattern imaging

I. Physiological measurement:

This measurement can either be morphological or biological. For morphological analysis finger prints, shape of hand, finger, vein pattern, eye (iris and retinal) etc. For biological analysis, DNA, blood, saliva, etc.

II. Behavioral measurements:

Most common behavioral measurements are voice recognition, signature dynamics, keystroke dynamics, gestures.

III. Finger vein recognition:

Finger vein recognition is also known as vein matching or vascular technology. Through pattern recognition technique the image taken from one's finger vein pattern is verified.

IV. Finger vein pattern imaging:

The vein patterns are invisible to the naked eye and it can be viewed through an image sensor that are sensitive to

near-infrared light of wavelengths 700-1000nm. Image of the finger vein can be captured by two methods 1) light reflection 2) light transmission

2. PROBLEM IDENTIFIED

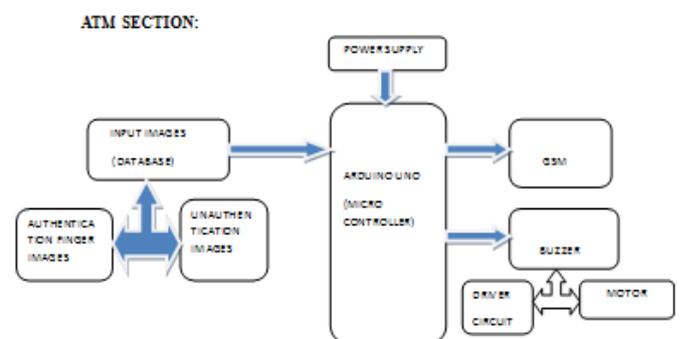
In existing system, personal identification number (PIN) is given for each individual to secure their amount. But this seems vulnerable to the risk of exposure and it can easily be forgotten. Fake cards can also be made for stealing the amount from the ATM. Recently many hackers have hacked people's account. For example, finger prints and palm prints are usually frayed; voice, signatures, hand shapes and iris images are easily forged. So we use biometric authentication process.

3. PROPOSED MODEL

The finger-vein is a favorable biometric pattern for personal identification in terms of its security and convenience. The vein is hidden inside the body and is mostly invisible to human eyes. So it is difficult to forge or steal. The non-invasive and contactless capture of finger veins ensures both convenience and hygiene for the user, and is thus more acceptable. The finger-vein pattern can only be taken from a live body. Therefore, it is a natural and convincing proof that the subject whose finger -vein is successfully captured is alive. In this technology, we proposed in the automatically door will be closed, when unauthenticated finger is pressed.

4. PROPOSED DIAGRAM

The proposed model block diagram is represented as follows:



Finger Vein Image

Figure1. Architecture Diagram

4.1. BLOCK DIAGRAM DESCRIPTION

The database contains the information such as authenticated and unauthenticated finger vein images. These images are given as input to the Arduino microcontroller which runs with the help of power supply. The controller processes the data given and sends the messages using GSM to indicate whether the finger vein is authenticated or not. The unauthenticated outputs are indicated by the buzzer connected to the microcontroller. The motor connected to the controller will run indicates that the finger vein is authenticated. (Refer Figure 1)

5. SOFTWARE SECTION

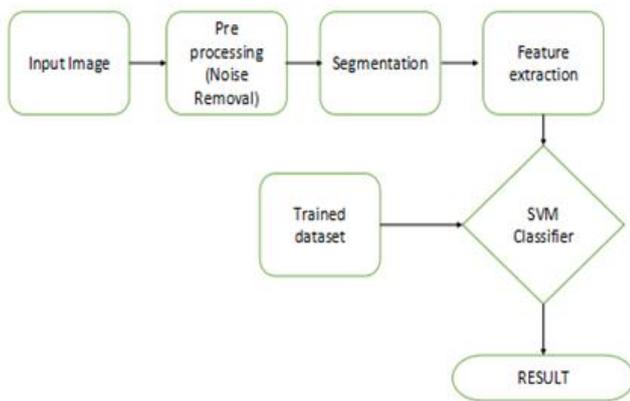


Figure2. Software Architecture

5.1. SOFTWARE SECTION DESCRIPTION

The user finger vein is given as input image to the preprocessor, where the noise of the image is removed using the Gaussian Bilateral filter. Then segmentation of the image is done by using OTSU's thresholding method. The segmented image is enhanced using dilation process. Features such as mean, standard deviation, entropy, variance, skewness are extracted from the image by using HAAR wavelet transform. The Support Vector Machine (SVM) represents a clear better quality image. The obtained image is compared with the pre defined data from the trained data sets. If the user finger vein matches the pre defined data, the process is authenticated and if not, the process is unauthenticated. (Refer Figure 2)

6. FEATURES DESCRIPTION

The features present in the proposed diagram are as follows:

6.1. ENHANCEMENT

Here Gaussian bi-lateral filter is used for enhancement. A bi-lateral filter is a non-linear, edge-preserving and noise reducing smoothing filter for images. It replaces the intensity values from nearby pixels.

6.2. SEGMENTATION

In computer vision, image segmentation is the process of portioning a digital image into multiple segments (set of pixels). The original image can be changed into something meaningful and easier way to analyze.

6.3. FEATURE EXTRACTION

HAAR wavelets transform used for feature extraction. The image transforms are widely used in image filtering. In mathematics, the HAAR wavelet is a sequence of rescaled "square shaped" function which together form a wavelet family.

6.4. ALGORITHM- SUPPORT VECTOR MACHINE

Support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data used for classifications and regression analysis. Given a set of training examples, each marked as belonging to one or the other of two categories. A SVM training algorithms builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier. As SVM model is a representation of the examples as points in space. Mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to a category based on which side of the gap they fall on.

7. HARDWARE SECTION

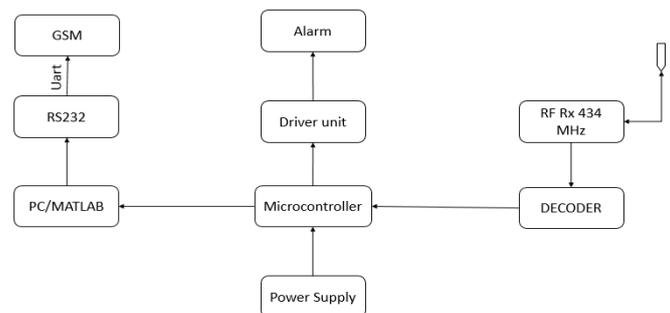


Figure 3. Hardware Section

7.1. MODULES DESCRIPTION

The modules present in the proposed hardware diagram (Refer Figure 3) are as follows:

7.1.1. GSM

Global System for Mobile communication network providers put customer information on a removable sim card. This makes it easy to switch phones when just take the sim card out of the old phone and insert it into the new one.

7.1.2. Motor

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this is the conversion of mechanical energy into electrical energy and is done by an electric generator.

7.1.3. ALARM

In this process if the unauthenticated person tries to take money from ATM machine, it will be alert the buzzer and further process will be done.

7.1.4. BUZZER

A buzzer is an audio signaling device, which may be mechanical, electromechanical or piezo electrical. A typical use of buzzers includes timers, alarm devices, and conformation of user input such as a mouse click. A standard bell ringer design works just like a buzzer.

7.1.5. ARDUINO MICROCONTROLLER

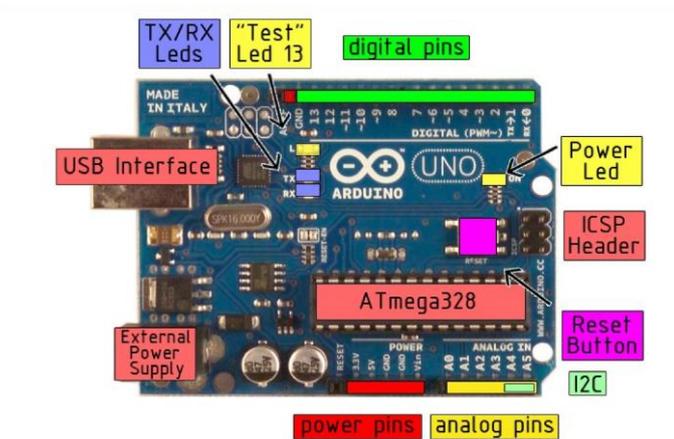


Figure 4. Arduino (ATmega 328) microcontroller

Arduino is a tool for making computer that can sense and control more of the physical world than your desktop computer. Arduino (Refer Figure 4) taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, Max MSP).

7.1.6. RS -232

RS- 232 stands for recommend standard number 232. The serial ports on most computers use a subset of the RS-232C standard. The full RS-232C standard specifies a 25pin "d" connector of which 22 pins are used.

8. RESULTS AND DISCUSSION

8.1 SOFTWARE OUTPUTS

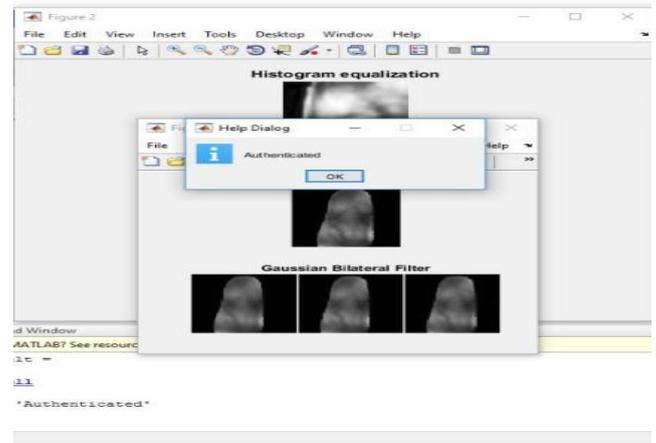


Figure 5: Authenticated Image

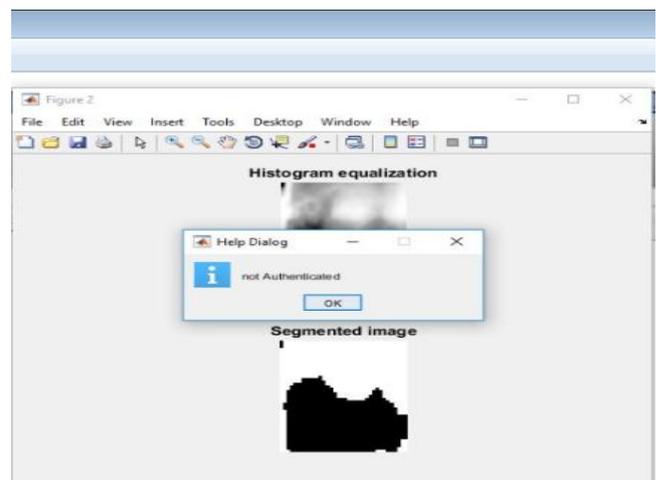


Figure 6: Unauthenticated Image

8.2 HARDWARE OUTPUT

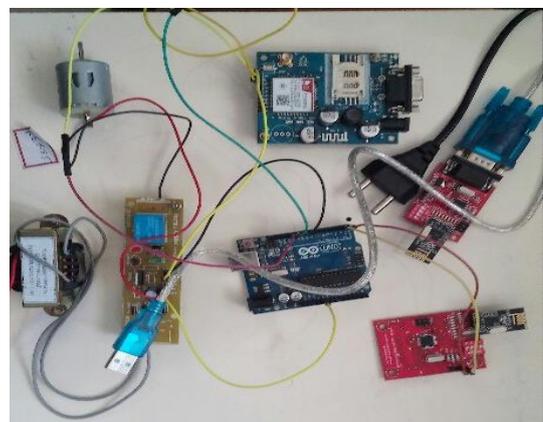


Figure 7: Hardware Output

9. CONCLUSION

In previous days, ATM cards are used for money transaction. Usually people insert an ATM card and get their money. We are hearing more news that, hackers were hacking people's money. These kinds of cyber-crimes increase by these years and also by using infrared detecting technology, they detect the pin number and they steal people's money. In order to overcome this disadvantage, we developed a unique method. We are using finger vein detection for money transaction and also for depositing amount. As each and every user has unique finger vein, there is no chance for strangers to transact money unknowingly.

10. REFERENCES

- [1] L. Marozas, R. Bau, T. Grigalis, "Requirements analysis for distant iris recognition access control systems and methodology proposal," 2016 Open Conference of Electrical, Electronic and Information Sciences (eStream), IEEE, 2016.
- [2] J. A. Unar, W. C. Seng, and A. Abbasi, "A review of biometric technology along with trends and prospects," *Pattern Recognition*, vol. 47, pp. 2673-2688, 2014.
- [3] Y. Wang, K. Zhang, and L.-K. Shark, "Personal identification based on multiple key point sets of dorsal hand vein images", *IET Biometrics*, vol. 3, no. 4, pp. 234-245, 2014.
- [4] P. M. Corcoran, "Biometrics and consumer electronics: a brave new world or the road to dystopia?" *IEEE Consumer Electron. Magazine*, vol. 2, no. 2, pp. 22-33, Apr. 2013.
- [5] S.-H. Lee, D.-J. Kim, and J.-H. Cho, "Illumination-robust face recognition system based on differential components," *IEEE Trans. Consumer Electron.*, vol. 58, no. 3, pp. 963-970, Aug. 2012
- [6] A. Yuksel, L. Akarun, and B. Sankur, "Hand vein biometry based on geometry and appearance methods," *IET Computer Vision*, vol. 5, no. 6, pp. 398-406, 2011.